



IBM Systems and Technology Group

40 Jahre VSE Happy Birthday !



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“The further backward you look, the further forward you can see.....”

.....Sir Winston Churchill



IBM System/360 – 1964

- Customers were frustrated with the migration costs that came with each processor upgrade
- IBM developed a family of processors using the same durable architecture
 - published in the S/360 Principles of Operations
 - 24-bit addressing (32-bit architecture)
- Solid logic circuit cards
- Common peripheral devices
- One operating system - *initially*
 - Operating System/360 (OS/360)



S/360 Family



Model	Announced	First Shipped
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30	April 7, 1964	June, 1965
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40	April 7, 1964	April, 1965
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50	April 7, 1964	August, 1965
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20*	November 18, 1964	April, 1966
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65	April 22, 1965	November, 1965
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75	April 22, 1965	January, 1966
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44	August 16, 1965	June, 1966
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67	August 16, 1965	May, 1966
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91	January 18, 1966	October, 1967
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25	January 3, 1968	October, 1968
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85	January 30, 1968	December, 1969
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195	August 20, 1969	March, 1971
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**focused on scientific
early Virtual Storage**

1965

■ S/360 - Model 30 System

- Approx. 40 KIPS (0.04 MIPS)
- Solid Logic Technology
- 8 to 64 KB main storage
 - ferrite core memory technology
- 2311 Disk Storage Drive
 - 7.25 MB/removable pack
 - 75 ms average access time
- 2401 Magnetic Tape Unit
 - 9 track, 1600 bpi
 - Up to 180,000 bps
- 2540 Card Read/Punch
 - 1000 cpm read
 - 300 cpm punch
- 1403-N1 Line Printer
 - up to 1100 lpm

■ Disk Operating System/360

- Releases 1 => 27
 - designed for 16-32 KB systems
 - disk used for program libraries, transient supervisor functions, etc.
- 1 partition
 - up to 3 beginning in Release 3
 - batch multiprogramming in R16
- BTAM for telecommunications
 - added in Release 3
- User programming in Macro Assembler, COBOL, Fortran, PL/1, and RPG



S/370 family

Model	Announced	First Shipped	
155	June 30, 1970	January, 1971	
165	June 30, 1970	April, 1971	
195	June 30, 1970	August, 1973	
145	September 23, 1970	June, 1971	Virtual storage capable models
135	March 8, 1971	April, 1972	
158	August 2, 1972	April, 1973	
168	August 2, 1972	May, 1973	
125	October 4, 1972	April, 1973	
115	March 13, 1973	March, 1974	
138	June 30, 1976	November, 1976	
148	June 30, 1976	January, 1977	

1972

■ S/370 - Model 135 System

- Approx. 180 KIPS (0.18 MIPS)
- Compatible upgrade from S/360
- Integrated Circuit technology
- 96 to 256 KB Processor Storage
 - 'monolithic' storage technology
 - virtual storage
- 3330 Direct Access Storage
 - 100 MB/removable pack
- 3420 Magnetic Tape Subsystem
 - 9 track, 1600 bpi
 - up to 320,000 bps
- 3505 Card Reader/3525 Card Punch
 - 1200 cpm read
 - 300 cpm punch
- 3211 Printer

Starting to look like something
that's recognizable as VSE

■ DOS/VS

- Releases 28 => 34
- up to 16 MB virtual storage
- Linkage Editor, Relocating Loader
- 5 partitions (up to 7 in R34)
- VSAM
 - balanced sequential/random
- POWER (first a Type III in 1968)
 - short for "Priority Output Writers,
Exception Processors, and Inter
Readers"
- 'DBDC' => CICS and DL/I



1979

■ IBM 4331 System

- Approx. 200-400 KIPS (0.2 - 0.4 MIPS)
- Large Scale Integration (LSI) technology
- 512 and 1024 KB Processor Storage
 - 64K bit memory chip technology
 - Integrated I/O adapters
 - optional ECPS ('e' mode)
- 3310 Direct Access Storage
 - Fixed Block Architecture (FBA)
 - 64.5 MB/fixed (non-removable) media
- 8809 Magnetic Tape Subsystem
 - 9 track, 1600 bpi
 - up to 160,000 bps
- 3505 Card Reader/3525 Card Punch
 - 1200 cpm read
 - 300 cpm punch
- 3262 Printer
 - up to 650 lpm

■ DOS/VSE

- 7 partitions
 - up to 12 in Release 2
- Fixed Block Architecture (FBA)
- Misc. Enhancements
 - ASI procedures, channel switching, DASD sharing, add statements, missing interrupt handler, etc.
- MSHP
- ICCF (based on ETSS Type III)
- ACF/VTAM
- Priced Components



1987

■ IBM 9375 – Model 60 System

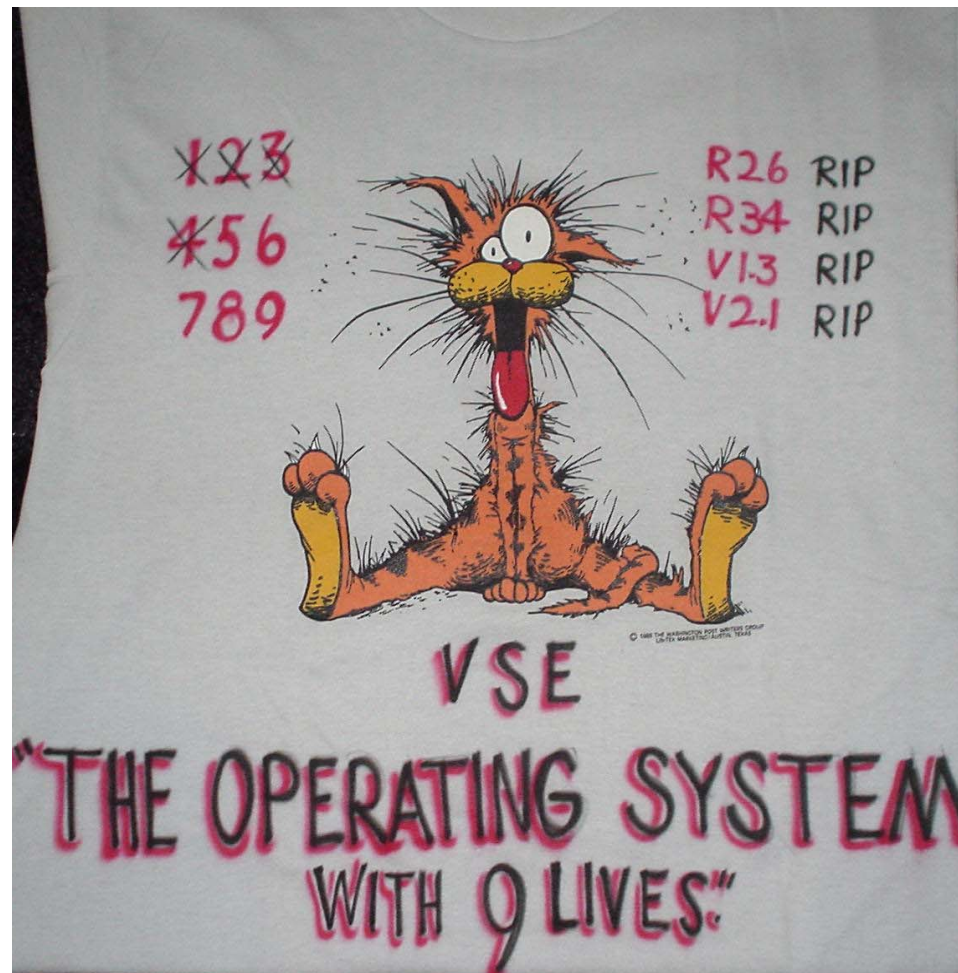
- First CMOS Processor
- Approx. 1.000 KIPS (1.00 MIPS)
- Modular, 19" rack-mounted
- 8 or 16 MB Processor Storage
 - Integrated I/O adapters
 - office environment
- 9332 Direct Access Storage
 - Fixed Block Architecture (FBA)
- 9347 Magnetic Tape Subsystem
 - 9 track, 1600 bpi



■ VSE/SP V3

- 12 partitions
- Virtual Address Extensions (VAE)
 - up to 9 address spaces
- New Librarian
- Interactive User Interface (IUI)
- Conditional JCL
- Packaging
 - base and optional products
 - base was designed, developed, tested, shipped, and serviced as if it were a single integrated system
- Capacity-based Pricing

How many lives does a Cat have?



The 1990's – revitalization of VSE!

.....the decade began with ES/9000 and VSE/ESA V1

.....followed by IBM's CMOS Transition and VSE/ESA V2



1993

■ ES/9221 – Model 150 System

- Approx. 4,4 MIPS
- 16 to 256 MB Processor Storage
 - Modular, 19" rack-mounted
 - Integrated I/O adapters
 - PR/SM
 - Parallel and ESCON Channels
- 9336 Direct Access Storage
 - Fixed Block Architecture (FBA)
 - 857 MB/fixed media
- 3490 Magnetic Tape Subsystem
 - 200 MB cartridges
 - up to 4.5M bps

■ VSE/ESA V1.3

- Dynamic partitions
 - number limited only by tasks
 - 1 partition per address space
- 31-bit real and virtual addressing
- Access Registers
- Data Spaces
- Virtual Disk
- Virtual Storage Constraint Relief
- Dynamic (XA) Channel Subsystem
- ESCON Channels

1998

■ Multiprise 2000 System

- Approx. 3,5 - 155 MIPS
- based on G3 CMOS technology
- 1 to 5-way Processing Units
- 128 MB to 4 GB Processor Storage
- Parallel and ESCON Channels
- Integrated DASD
 - a portion of main memory for cache
 - emulate 3380/3390 ECKD
 - up to 288 GB capacity
- and/or RAMAC External DASD
- Open Systems Adapter (OSA)
- 3490E Magnetic Tape Subsystem
 - 2.4 GB/cartridge with IDRC



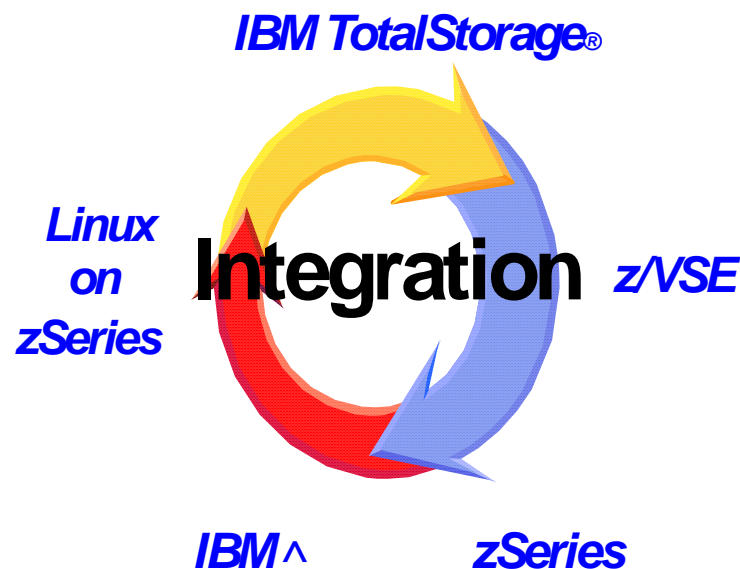
■ VSE/ESA V2.3

- Year 2000 ready
- optional Turbo dispatcher
 - support for n-way processors
- VSAM KSDS > 4GB
- set timezone/daylight savings time
- TCP/IP for VSE/ESA (native)
 - offered under agreement with CSI
- ACF/VTAM V4.2
- LE and LE-based languages
 - COBOL for VSE/ESA
 - PL/1 for VSE/ESA
 - C for VSE/ESA
- Improved console support

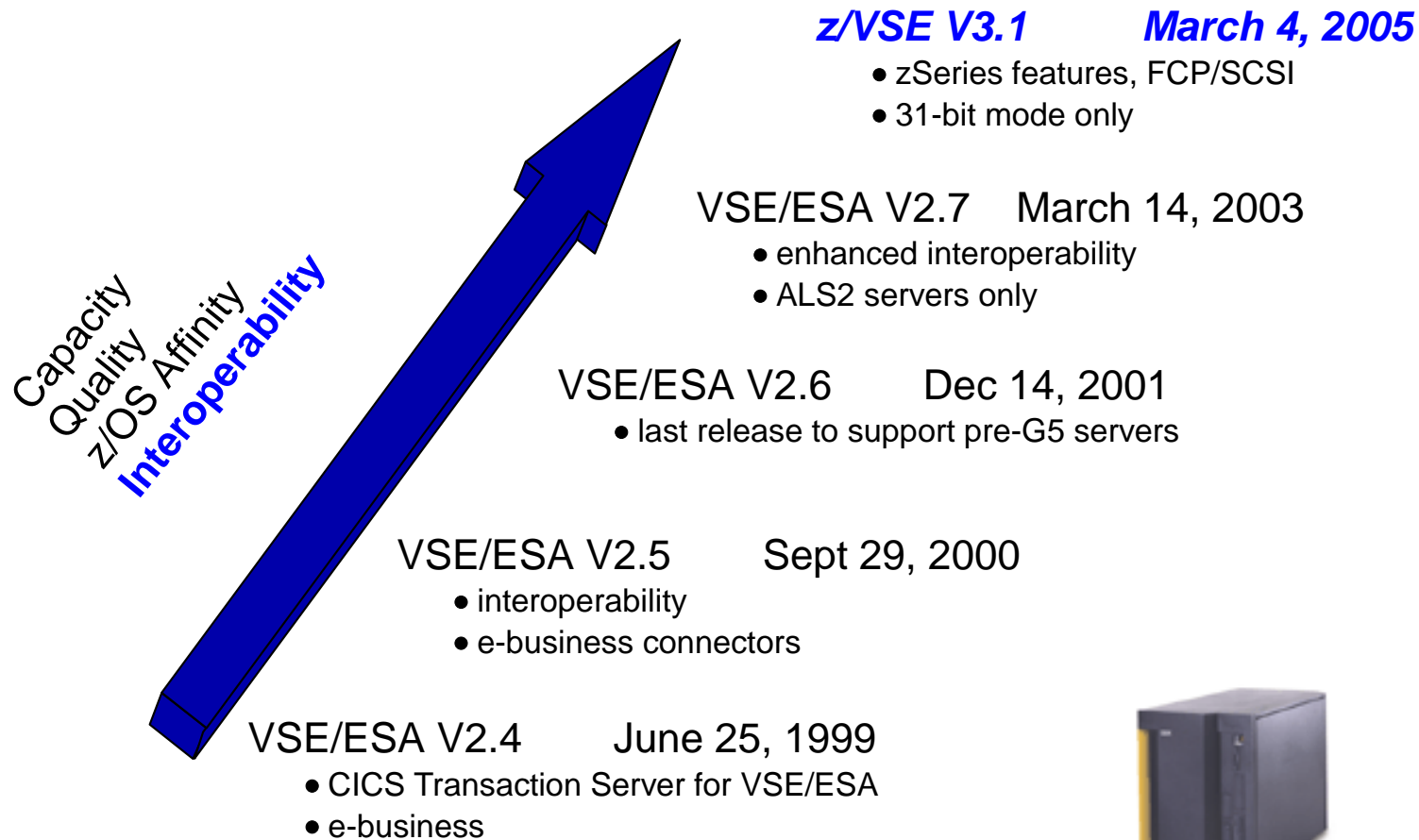
The 2000's

...a new century begins with Multiprise 3000 and VSE/ESA V2

...looking to the present with IBM ^ zSeries and z/VSE V3



Recent VSE Innovation



2005

■ IBM ^ zSeries 890

- based on innovative z990 technology
- 1 model, 28 capacity settings
 - 1 to 4 Processing Units (PUs)
 - 26 – 1365 MIPS
- 8 to 32 GB Processor Storage
- up to 30 LPARs, up to 2 LCSSs
- Hipersockets
- ESCON, FICON Express, FCP Channels
- PCICA encryption assist
- OSA Express & OSA-ICC
- Integrated Facility for Linux (IFL)
- IBM Enterprise Storage Server (Shark)
 - high availability, high performance
 - Flashcopy and PPRC
 - 1 to 55.9 TB capacity
- IBM 3592 TotalStorage Enterprise Tape
 - 900 GB/cartridge at 3:1 compression
 - up to 40 MB transfer rates

■ z/VSE V3.1

- Turbo dispatcher
 - support for n-way processors
- CICS TS for VSE/ESA
 - availability and z/OS affinity
- TCP/IP for VSE/ESA
 - offered under agreement with CSI
- VSE e-business connectors
- Web services
- Hipersockets
- PCICA encryption assist
- Shark Flashcopy and PPRC
- FCP-attached SCSI disks



40 Years of Progress in Hardware

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 - Hipersockets
 - ESCON, FICON Express, FCP
 - PCICA encryption assist
 - OSA Express & OSA-ICC
 - Integrated Facility for Linux (IFL)
- IBM ESS (Shark)
 - high availability, high performance
 - Flashcopy and PPRC
 - 1 to 55.9 TB capacity
- 3592 TotalStorage Enterprise Tape
 - 900 GB/cartridge at 3:1 compression
 - up to 40 MB transfer rates



40 Years of Progress in Software

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- TCP/IP for VSE/ESA
 - offered under agreement with CSI
- VSE e-business connectors
- VSE Web services SOAP/XML
- Hipersockets
- PCICA encryption assist
- ESS Flashcopy 2 and PPRC
- FCP-attached SCSI disks



Two lessons can be drawn from history...

- 1. The revolution that begun 40 years ago never ended*
- 2. Legacy systems are systems that work!*

